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Operational and Mission Highlights

A MONTHLY SUMMARY OF TOP ACHIEVEMENTS

December 2020

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CVD Project at CMR Wraps Up with Tenth Vessel

The week of December 11, 2020, a years-long materials disposition project based at the Chemistry and Metallurgy Research (CMR) facility has at last come to a close. After emptying and dispositioning nine vessels from 2014 to January 2020, LANL teams determined that the tenth vessel required assay (measurement and characterization).

During the 1970s and into the 1980s, the Laboratory conducted experiments that generated data for use in computer modeling to evaluate the performance of nuclear weapons. Six-foot, sealed, steel vessels were used to contain the blast and radioactive material. The Confinement Vessel Disposition (CVD) project removes the contents of these legacy six-foot-diameter vessels, recycles useful material, and disposes the balance of the material as waste while exercising commitment to safety, security, and the protection of the environment.

Work associated with the tenth vessel started in March 2020, but it was set back as a result of delays associated with COVID-19. During the week of December 7, 2020, this tenth vessel was confirmed empty of transuranic waste and moved to the staging area. This is the final vessel in the CMR Vessel Disposition project, thus paving the way for project closure. The completion of vessel 10 demonstrates the successful disposition of this legacy plutonium material that has been staged onsite in these confinement vessels for more than 40 years.

Detonator Production's Deliverables Support the Nuclear Enterprise Nationwide

The Laboratory's Detonator Production Division finished the fiscal year strong, achieving a long list of deliverables that support the weapon-assembly needs of Pantex, Kansas City National Security Center (KCNSC) and Lawrence Livermore National Laboratory (LLNL). For B-61 programs, division personnel sent a production lot of 1E40 dummy detonator cable assemblies (DCAs) in April 2020, and a production lot of 4E10 dummy DCAs in May 2020. Personnel also manufactured, diamond stamped, and shipped pad alignment tools to Pantex in August 2020. Continuous production enables earlier delivery of parts to Pantex, thus help-

ing to alleviate schedule delays resulting from KCNSC header delivery delays. Continuous production avoids the need to produce hundreds of parts in one large lot tested at the end of manufacturing.

In FY20, a variety of products were manufactured and shipped to support the W80-4 program. The first development lot was completed for both DCA and pellet can assemblies (PCAs), with more than 200 DCAs and nearly 200 chip-cable assemblies manufactured. LLNL will use these assemblies for development testing. More than 800 PCAs were shipped to KCNSC and LLNL for development tests. Five different types of cables were delivered to Sandia National Laboratories to meet the Alt940 development and process prove-in schedules. Four of the cable types were fully manufactured at LANL. 1E38 DCAs were diamond-stamped and shipped to Pantex to meet stockpile needs for Alt370. These DCAs will support W88 Alteration 370 weapon builds at Pantex for the next three years.

Key Gloveboxes Prepared for Special Nuclear Shipping Project

Teams in Actinide Materials Power & Processing (AMPP) made significant progress on a Special Nuclear Shipping project. The project is part of the Plutonium Sustainment Development, Test, and Evaluation Milestone. This milestone involves retrieving material from the Plutonium Facility vault, repackaging it into containers, and shipping it offsite.

In November 2020, the AMPP-4 Uranium Disposition team successfully turned the air box into an inert — chemically inactive — box and added an airlock by removing old equipment, cleaning and stripping the glovebox and more — all necessary steps to work toward the June 2021 completion milestone. All this hands-on work was done amidst strict COVID-19-related precautions and guidance.

Major Steps in Pit Production Pave the Path to First Production Unit

Working closely with NNSA, the Laboratory has demonstrated progress in meeting production milestones in Fiscal Years 18–20, and, during the week of December 14–18, 2020 the achievement, at the Plutonium Facility brings that milestone one step closer.

For the first time, teams in Pit Technologies successfully implemented a tube modification for pit production that has been in the works for the past three years.

Working alongside Lawrence Livermore National Laboratory to achieve the design change for the First Production Unit (FPU) and the ongoing pit mission, more than 30 employees in program and engineering work successfully took this step, thus keeping the Laboratory on track in meeting this goal. The past three years included changes and updates to equipment, tooling, procedures, and worker training. The modification was first successfully performed in the Plutonium Facility on December 15, 2020. Alongside key-tube operations, the Weapons Production pit manufacturing team completed pit build 21-1 on December 23, 2020. This build is the first pit produced in FY21. Nondestructive evaluation and radiography will be completed after the holiday break.

From 2007 to 2011, LANL, the nation's Plutonium Center of Excellence, achieved 10-pits-per-year capacity to support the W88 warhead stockpile. Since then, teams have not only started up inactive processes but also implemented new processes and technologies, such as those noted here, as they prepare for achieving at least 30 pits per year by 2026.

Process Update Leads to Significant Savings in Pit Production

Multiple teams supporting Weapons Production collaborated to remove a requirement that led to exceptional time and money savings. The MT38 Far Field Gamma measurement and analysis requirement was determined safe and acceptable for removal in the Plutonium Facility's pyrochemical and electrorefining processes. Removing this step will save one hour per sample for data collection and analysis, which will amount to 240 hours' worth of savings per year. This analysis and taking action to improve processes continues to support the ramp up to the production of at least 30 pits per year.

SCIENCE, TECHNOLOGY, AND ENGINEERING

EES Research Reveals How and Why Methane is Escaping the Seafloor

The world's seafloors contain great amounts of the potent greenhouse gas methane, yet the observed release of this gas remains a mystery — that is, until now. Laboratory scientists Phong Nguyen, Bill Carey,

and Hari Viswanathan, all from the Earth and Environmental Sciences (EES) Division, recently contributed to a new international study that helps explain how and why columns of methane escape formations below the seafloor.

Researchers combined deep-sea observations, laboratory experiments, and computer modeling to develop findings reported in the following [article](https://physicstoday.scitation.org/doi/10.1063/PT.6.1.20201203a/full/) published in the *Proceedings of the National Academy of Sciences*: "Crustal fingering facilitates free-gas methane migration through the hydrate stability zone" (<https://physicstoday.scitation.org/doi/10.1063/PT.6.1.20201203a/full/>). Physics Today and MIT both promoted the article.

The team observed a new phenomenon of how methane expansion creates enough pressure to essentially rupture the hydrate shell and form a kind of tube around the bubble as it moves upward. This observation is the first to explain how hydrate formation will not inhibit gas flow; in this case, the formation actually facilitates flow by providing a conduit and directing the flow upward.

First Earthquake Rupture Direct Observation and Machine-Learning Competition

A Laboratory research team led by scientist Bertrand Rouet-Leduc of the Earth and Environmental Sciences (EES) Division, along with colleagues from the Geophysics group, has used a neural network — a form of machine learning — to reveal the first direct observation of rupture propagation in the earth during a slow earthquake. The team trained the neural network to remove atmospheric "noise" in the data and extract ground deformation from InSAR data — images from the North Anatolian Fault in Turkey.

This artificial-intelligence approach works without expert interpretation or previous knowledge of the fault system under study. A satellite-based mapping technique, InSAR, uses radar to create images of ground deformation. The new deep-learning tool corrects for distortions and learns to distinguish signal from noise. The LDRD-funded research will be presented December 15 at the AGU Fall Meeting (https://int.lanl.gov/news/news_stories/2020/december/1209-machine-learning.shtml?source=lanltoday).

The team also reported that an EES-led machine-learning competition was held on the Kaggle platform to predict the timing of laboratory-generated earthquake

simulations. This competition attracted more than 4,500 teams, some of which used unexpected computational strategies that yielded insights into fault processes. The results suggest the value of engaging the machine-learning community through competitions in other scientific problems of significance. The *Proceedings of the National Academy of Sciences* will publish an article authored by Paul Johnson, et al. about the results. The article will be titled “Laboratory Earthquake Forecasting: A Machine Learning Competition.”

From the Mountains to the Sea: EES Prepares for Colorado and Houston Field Campaigns

Mountains are the natural water towers of the world. However, to date Earth Systems Models have been persistently unable to predict the availability of such water resources. A team from the Laboratory’s Earth and Environmental Sciences (EES) Division plans to change this.

Having recently completed the world’s largest and longest Arctic research campaign, the team is currently preparing to investigate sites in Crested Butte, Colorado. It is here that the team will manage and operate research stations that contain dozens of advanced atmospheric instruments for DOE’s ARM (Atmospheric Radiation Measurement) climate user facility’s Surface Atmospheric Integrated Field Laboratory (SAIL) campaign, scheduled to begin in September 2021.

A collaboration with the Rocky Mountain Biological Lab, this campaign will focus on the East River Watershed, which is part of the Colorado River Basin. The SAIL campaign will advance atmosphere-through-bedrock understanding of mountainous water cycles by collocating ARM atmospheric observations with longstanding collaborative resources, including ongoing surface and subsurface hydrologic observations from the DOE’s Watershed Function Science Focus Area (SFA).

EES-14’s ARM Program Leader Heath Powers, along with SAIL Team Leader John Bilberry, performed COVID-safe site surveys in August and October with campaign investigators, including Allison Aiken. Last week, Bilberry deployed drone flights — a first for an ARM site assessment — to finalize instrument locations.

Notorious for its severe weather, subtropical Houston offers a unique environment where isolated convective systems are common and experience a spectrum

of polluted aerosol conditions from urban and industrial areas. The EES team is performing beta tests for the next DOE ARM field campaign, [TRacking Aerosol Convection interactions ExpeRiment \(TRACER\)](#), scheduled for deployment in Spring 2021. The Department of Energy will determine deployment based on COVID-19 precautions.

The principal focus of the TRACER campaign — the impact of aerosols on convective strength and convective processes — remains a challenging problem, one that requires detailed measurements and modeling of convective clouds, aerosols, and atmospheric thermodynamics. Notably, many DOE projects during 2020 have joined this campaign.

“Atmospheric processes leading to cloud formation and precipitation are notoriously complex and difficult to model accurately,” says Chris Fall, director of DOE’s Office of Science, regarding the July 2020 announcement of atmospheric funding. “These studies, which combine observation and modeling, will be important steps toward more precise and predictive models on both regional and global scales.”

The team is also testing the Balloon Borne Sounding Systems (BBSS) by releasing weather balloons at TA-51. In Houston, this team will be launching BBSS daily during the campaign. Instrument mentors and Aiken’s co-investigators will not be visiting the Laboratory during testing as a result of COVID-19. Instruments are successfully running and the test is nearly complete.

Lack of Sleep Could Be a Problem for AIs

Some types of artificial intelligence (AI) could start to hallucinate if they do not get enough rest, according to Garrett Kenyon of Information Sciences (CCS-3). Kenyon’s study recently appeared in the December issue of *Scientific American*.

One of the distinguishing features of machines is that they do not need to sleep, unlike humans and any other creature with a central nervous system. However, based on the new research that Kenyon and his team are conducting at the Laboratory, devices revolutionized with the advent of practical AI technologies may need to “nap” from time to time.

The full article can be found at the following site: <https://www.scientificamerican.com/article/lack-of-sleep-could-be-a-problem-for-ais/>.

Los Alamos and Michigan State University Researchers Document Association Between Influenza Receptor, Sialic Acid, and Viral Load in Wild Waterfowl

Laboratory researchers in the Biosecurity & Public Health Group teamed with colleagues at Michigan State University to investigate if high viral loads of avian influenza (potential super spreaders) in wild waterfowl were associated with a higher occurrence of the receptor protein for influenza, known sialic acid. Understanding how individual variation in pathogen load influences disease transmission is an important knowledge gap for understanding the current SARS-CoV-2 virus (responsible for the COVID-19 pandemic), as well as all zoonotic pathogens. The results of this study provide quantitative evidence that the abundance of sialic acid is related to avian influenza titers. A follow-up to an LDRD ER (Laboratory-Directed Research and Development Exploratory Research), this project was the first experimental infection to document this association between viral load and variation in the receptor protein.

Reference: Dolinski, Amanda; Jankowski, Mark; Fair, Jeanne; and Owen, Jennifer. The association between SA α 2,3Gal occurrence frequency and avian influenza viral load in mallards (*Anas platyrhynchos*) and blue-winged teals (*Spatula discors*). *AMC Veterinary Research* (2020) 16:430. <https://doi.org/10.1186/s12917-020-02642-7>.

New Mineral Named After EES Scientist Hongwu Xu

A newly discovered mineral has been named “Xuite” after scientist Hongwu Xu (Laboratory’s Earth and Environmental Sciences Division) and colleague Huifang Xu (University of Wisconsin) to honor their contributions to mineralogy and geology. Discovered and characterized by researchers at NASA, Universities Space Research Association, and Washington State University, XUIITE is a magnetic, ferric, iron-rich hydrogarnet phase, which has been found at two separate locations in Idaho and Wyoming. Xuite, $\text{Ca}_3\text{Fe}_2[\text{AlO}_3(\text{OH})]_3$, is a new member of the garnet group (hydrogarnet subgroup). The International Mineralogical Association approved the honored naming.

Novel Imaging Offers Insights for HIV and COVID-19 Treatments

Researchers in the Laboratory’s Theoretical Division, in collaboration with scientists from the Scripps Research Institute, have developed a novel imaging method that has led to the most detailed glycan (i.e., sugar molecule) mapping of HIV, the virus that causes AIDS. These sugar molecules shield HIV from the immune system. Mapping these molecules can reveal gaps where sugar is lacking, making such gaps ideal for vaccine targeting.

The collaborators used an integrated approach to imaging that included cryo-electron microscopy, computational modeling and site-specific mass spectrometry. This novel approach delivered the first-ever detailed mapping of sugars on the HIV spike protein, known as Env.

According to lead author Srirupa Chakraborty of the Laboratory’s Center for Nonlinear Studies, the ability to visualize and quantify the glycan shield in such extraordinary detail offers a significant advantage in the ongoing battle against viruses. This new sugar-shield mapping approach is poised to aid vaccine design and development for many glycogen-shielded viruses, including HIV.

Sequencing, Finishing, and Analysis in the Future Meeting Held This Week

The 15th annual Sequencing, Finishing, and Analysis in the Future (SFAF) meeting took place from December 1–3, 2020. Hosted by the Laboratory and MRI Global, this meeting is typically held in late May in Santa Fe. Because of the COVID-19 pandemic, this year the meeting was postponed and moved to a virtual setting.

The SFAF Meeting attracts hundreds of international participants each year to share their science and discuss the role of genomics in research, in addition to the technology that enables such research. This year’s keynote and invited speakers focused not only on genetic and chronic diseases but also on important collaborations providing SARS-CoV-2 sequencing data that will enable an effective global response to the COVID-19 virus.

Bravo Loop Testing Successful

The Bravo cooling loop extends the water-cooled capacity available in the Laboratory Data Communications Center's High Performance Computing (HPC) data center to over half of the available floor space. On December 15, 2020, the loop demonstrated cooling under considerable load as HPC fired up the new cluster, Chicoma, at over a third of a megawatt for the duration of the test. The loop handled the load easily, requiring only two-thirds of the vendor-recommended water flow to cool Chicoma. HPC Division would like to thank the Shasta Assessment Team for getting the system up and running, as well as Steve Johnson, (HPC-DES) for running a compute load to heat-up the system. The division would also like to thank the Data Center Management Mechanical Team and Victor Aragon (PIO-SU) for coordinating the test with the Shasta Assessment Team and for taking the readings.

Business Management Directorate Launches New Spot Award Tool

The following Laboratory divisions collaborated to launch a new automated tool that issues Spot Awards: Finance (FIN), Controller (CNTL), Human Resources (HR), and Software and Applications (SAE). These monetary awards provide an immediate, on-the-spot reward to employees who exceed performance expectations. Anyone can use the tool to nominate a fellow Lab employee.

Not only does the new tool simplify the award nomination and approval process, it also streamlines the tracking of an organization's available funding for this reward. Electronic status notifications are sent to the nominator throughout the process, enabling the nominator to provide immediate notification to the recipient. The new tool has the following enhancements:

- AccessIT makes available Spot Award point of contact (POC) entitlements,
- The tool has prepopulated the Primary POCs for the Director's Office (DIR), Deputy Laboratory Directorates (DLDs) and Associate Laboratory Directorates (ALDs),
- The tool has allocated funding at DIR, DLD and ALD levels,
- Account coding has been assigned to each organization within the tool,

- The tool tracks Spot Award funds and availability, and.
- Non-eligible employees have been identified and removed.

FTWC Readiness Reviews and Report Completed

The Federal Readiness Assessment (FRA) of the Weapons Engineering Tritium Facility's Flanged Tritium Waste Container (FTWC) venting and handling operation was the last of the series of readiness reviews completed on November 13, 2020. The FRA concluded a year-long series of readiness reviews for this operation. Readiness Coordinators in Readiness and Technical Support (RPT-DO) worked with all four assessment teams in the series and with organizations connected with the operation. Coordinators scheduled review activities, addressed foundational logistics, and compiled and edited the final reports for each review. Because the Contractor Readiness Assessment, and to a greater degree the FRA, were conducted virtually, RPT-DO coordinators dealt with new opportunities that resulted in timely lessons learned. These opportunities included how to use teleconferencing for a variety of team activities and video to enable team members to view evolutions remotely. These and other lessons learned this year, including how to pause and resume a readiness assessment, came about as a result of the constraints of COVID-19 controls.

Hazardous Transportations Operations Team Supports Mission Critical Shipment to LANL

In November 2020, the Hazardous Transportations Operations Team supported a mission-critical transfer conducted in collaboration with C-Nuclear and Radiochemistry (NR) and NPI-7. The transfer took place from Sandia National Laboratories to Los Alamos National Laboratory. The collaborators transferred a UK-T173 drum in support of the joint project through the Atomic Weapons Establishment.

The material transfer is critical because there are no available commercial standards, especially for the analytes of interest. The purpose is to help both countries address the needs of certification of weapon systems in the US for DOE NNSA and in the UK for the Ministry of Defense. The program is part of Joint Operations Weapons Group-22/6 (JOWOG) uranium metal exchange program. Shipping support is absolutely the

most critical part of the program. The program simply does not happen without the same materials being available to the various participating labs in pristine conditions and in a timely manner.

High Performance Computing User Site Receives Major Upgrade

The [LANL HPC user website](#) was recently revamped with major content-quality improvements, improved search and improved navigation. The site now also has a modern look and feel. High Performance Computing (HPC) currently supports more than 12 production HPC clusters, various storage systems, and user services. More than 2,000 users are supported from various programs, including Advanced Simulation and Computing, Institutional Computing, and Global Security.

Driving the new infrastructure and technology were the following goals: simplify software maintenance, design/style flexibility, improve security, improve interfaces, easily maintain and create content, and integrate tools.

This revamp was phase 1 of the upgrade project. A list of new features and content are planned and are in progress for 2021. Although a large portion of HPC users are local and onsite, HPC does have many users that remotely access systems and services from other laboratories, universities, and across the US, especially now, given the COVID-19 pandemic. Phase 2 of the project will include upgrading the LANL HPC Secure website, creating new content, and providing an accessible version of the website to the public.

Laboratory Decreases Onsite Presence to Reduce COVID Risk Following Thanksgiving Break

Consistent with the rest of the state and nation, the Laboratory began seeing a sharp increase in positive COVID cases in November 2020. To reduce the risk of transmission and to keep the Laboratory safe, secure, and operational, leadership directed managers and employees to implement a slow, deliberate start after Thanksgiving. Employees largely worked from home on regular productive tasks, but also operational readiness scope such as document review, training, and strategy development.

The efforts to minimize onsite work were successful. During the December 3, 2020 accountability drill, 79% of the Laboratory's workforce was working offsite. This

effort is a decrease of more than 54% from November 2020. Of note, about 70% of the workforce participated in this drill within the first 30 minutes.

The Laboratory had a total of 57 new COVID cases in the week leading up to December 3, 2020, a drop from the previous week's increase of 89 cases.

Our expectation is that the actions to keep our employees safe will protect our mission in the long run.

Laboratory Employees are Focused on Safety Communications, Articles on SCoR Principles

The Public Affairs group (CEA-PA) in the Communications and External Affairs Division has ramped up its safety communications in FY21 as part of a new initiative to better communicate safety events and lessons learned to the Laboratory's dispersed workforce.

Stories on the internal home page that stress the Safe Conduct of Research (SCoR) principles were some of the most-viewed content in October and November 2020. An article published on October 16, 2020, [LANSCE fire: Getting it right when things go wrong](#) — detailing how SCoR principles guided employee response to the fire at the TA-53 Lujan Facility — received 2,003 on-line page views. Stories that also garnered significant readership in the past two months emphasized the importance of security and continuous learning at the Laboratory's National Security Research Center (1,923 page views), focused on employee self-care (1,738 page views), and highlighted a facility engineer honored for raising safety concerns (1,183 page views).

Staff members in CEA-PA have also been looking at different strategies to reiterate the importance of safe operations in all spaces at the Laboratory. Recognizing that regular communications supports strong engagement between management and employees and supports cultural change, employee newsletters for the Capital Projects and Facility and Operations Associate Directorates have highlighted one of the nine Life Critical Rules for serious injury and fatality prevention — such as heavy equipment safety and distracted driving — through colorful infographics for sharing with teams and groups. The newsletters have also included articles with the goal of improving safety awareness on an extensive range of safety topics, such as the importance of voicing concerns in unexpected conditions, helping stop hazardous energy events, and how adapting to change in a complex environment teaches resiliency.

Laboratory Receives Power Upgrades

On September 30, 2020, NNSA accepted upgrades to the existing Combustion Gas Turbine Generator. These upgrades enabled UI-FOD operations at the Laboratory to move from intermittent power generation to base-load power generation. The upgrades increase the power capacity to more than 25 MW of onsite generation. The upgrades are courtesy of an Energy Savings Performance Contract (ESPC) and Siemens Government Technologies.

This medium-sized turbine at the TA-03 steam plant provides numerous benefits to LANL, such as the following:

- Consumes natural gas and produces more than 30 percent of LANL's electric power,
- Significantly reduces LANL's greenhouse gas emissions by displacing power purchased from coal-fired generation,
- Enhances LANL's energy security posture and operational resiliency, and
- The ESPC finances major maintenance over 16 years of operation.

Network and Infrastructure Engineering Develops Remote COVID-19 Hotline for Emergency Operations Center

Network and Infrastructure Engineering for Telecommunication Services (NIE-TS) has converted the COVID-19 hotline to a call center. This new Broadsoft call center has established remote capabilities for the hotlines, thus enabling agents to work from home, if necessary. The new system also enables hotline staff to capture and respond to voicemail as call volume increases.

Employees can call the hotline by dialing 505-606-2667. A resource for all Laboratory employees during the pandemic, the hotline is staffed by nurses from Occupational Medicine. These nurses will answer questions about COVID-19, including health concerns, return-to-work guidance, and what to do if an individual becomes ill.

New Employee Training Academy Completes First Year

The FY20 pilot for the New Employee Training (NET) Academy in the Associate Laboratory Directorate of Weapons Production (ALDWP) is now complete, including enhanced ALDWP-specific orientation and improved Glovebox/Fissionable Material Handler training. Expedited Q-Clearance/HRP cycle times resulted in a 50 percent reduction in the amount of time needed to qualify the average Plutonium Facility worker, with the exception of any unexpected delays in the Q/HRP process caused by the COVID-19 pandemic.

NET Academy training by ORI-1, Training and Mission Services Group, has been performed in quarterly cohorts of 30 since January 2020 and will continue through FY21 at the same rate, with a slight delay planned for the FY21-Q2 cohort because of the COVID-19 pandemic. The refurbished space at the TA-35 TRIDENT facility continues through Phase 2 of the project, where a bathroom trailer, IT network installation and further outfitting of the space occurs (e.g., mock gloveboxes and simulation area). The Laboratory continues to look for additional classroom space to expand capability, including the renovation and repurposing of leased space in the County of Los Alamos that will provide approximately 30,000 square feet of learning environment to be occupied by more than 100 ALDWP staff and new hires moving forward to the 30-pit-per-year mission. This space will be used by ALDWP in collaboration with Human Resources to ensure streamlined hiring, orientation, onboarding and initial training for ALDWP employees and Savannah River staff. It is scheduled for beneficial occupancy in FY21-Q2.

Packaging and Shipping Training Program Developed, Presented to Management Review Board

The development effort of the Packaging and Shipping Training Program concluded after Bill Freeman presented the effort to the Management Review Board. During his presentation, Freeman discussed how his team incorporated shipping errors into the qualification standard. He also described the process from a high level to LANL-specific and then to facility-specific, referencing 49 CFR throughout the process.

Freeman emphasized how a qualification standard is not a requirement of the Department of Transport-

tation, adding that the Laboratory uses Qualification Standards as a best practice. He also covered continuing training, vendor training, and the requirements of hazardous materials packaging and transportation before an employee can start function-specific work based on the 10 created curricula.

In 2021, the team will focus on putting the program into the field.

Sigma Safety Oversight Groups Recognize Positive Behaviors and Opportunities for Improvement

Greg Barna, manager of Sigma's Infrastructure and Small Projects group, took immediate steps to improve safety after two reportable accidents occurred at the Sigma facility in May 2020. Barna and the Sigma team formed two new safety groups: the Senior Supervisory Watch (SSW) and the Sigma Strive for Excellence Team (SSET).

The primary goal of the SSW is to establish onsite coaching of Human Performance Improvement (HPI) tools, including HPI's "10 pillars." The SSW team provides input to Barna on positive and negative behaviors. Barna then reviews all SSW reports and implements a corrective action plan based on those reports.

The SSET's primary goal is to promote positive behaviors and look for improvement opportunities within the Sigma facility. This team consists of 17 volunteer members with representatives from Construction Management, Science and Technology Operations, Sigma programs and others.

Since the SSW and the SSET groups were established, safety performance at Sigma has improved significantly, particularly in the category of injuries. As of late October 2020, after the two accidents just five months before, Sigma documented that more than 38,000 working hours had been clocked with zero reportable injuries.

Site Sustainability Plan Submitted to NNSA

As required by DOE Order 436.1, the Laboratory's Sustainability Program submitted the FY21 Site Sustainability Plan to NNSA this week. This plan identifies LANL contributions toward meeting the DOE's sustainability goals, detailing the Laboratory's

- performance status,
- strategy and projected performance in facility energy use,
- fleet management,
- construction of high-performance sustainable buildings,
- water use,
- waste reduction, and
- other operations contributing to increasing efficiency, optimizing performance and reducing environmental impacts and costs.

UI Expects to Reduce Project Estimate by \$160 Million

Utilities and Institutional Facilities (UI) anticipates reducing a project estimate for the Electric Power Capacity Upgrade (EPCU) line-item project by \$160 million. The division informed NA-522 of this significant cost reduction from \$360 million to \$200 million during a briefing this week.

The project team will still meet all key performance parameters of the approved Project Requirements Document. The savings estimate is the culmination of several months' work involving an electrical modeling subcontractor, a conceptual design subcontractor, and several meetings with mission programs to generate alignment. Based on this successful briefing, the project team next will brief Ken Sheely/NA-52 and Jim McConnell/NA-50 in January 2021 and move the project along the path to inclusion in the FY23 Congressional budget. This project will ensure that the Laboratory has adequate electrical power to support planned growth for the next 30 years.

UI Outlines Traffic Upgrades to Access Current and Future Mission-Critical Facilities

Personnel from Utilities and Institutional Facilities (UI) briefed a program stakeholder on the planning and conceptual design for Pajarito Road and the four major intersections that provide access to mission facilities and land slated for 30-pits-per-year development. This study has been challenging because personnel cannot collect "normal" traffic performance data because employees are teleworking during the COVID-19 pandemic. The briefing went very well, even as personnel navigate the uncertainty about planned facility locations and competing program interests.

Uranium Shipment Continues to Pave Way for CMR Closure

Last month, Laboratory personnel shipped Uranium-233 (U-233) material to the Device Assembly Facility (DAF) at the Nevada National Security Site for staging. This work is key toward removing high-dose material from TA-55 and the ultimate closure of the Chemistry and Metallurgy Research (CMR) facility hot cells.

Unique nuclear material, test readiness material helps scientists better understand nuclear tests, especially because the production of equivalent material today is cost prohibitive. At DAF, the material will be retained for future programmatic needs. Shipping the high-dose U-233 material to DAF is a major step in the milestone closure of CMR because all material must be moved offsite before the CMR hot cells become unavailable. Initiated in FY18, this project is scheduled for completion in FY21.

COMMUNITY RELATIONS

\$2.8 Million Raised in One of the Laboratory's Most Successful Fundraisers

This year's Holiday Giving Campaign raised more than \$2.8 million to help northern New Mexico communities at this extremely difficult time, making it one of the Laboratory's most successful fundraisers ever. Employees donated the following:

- \$2.43 million to nonprofit organizations, with \$2 million of that staying in the region,
- \$360,000 to the Los Alamos Employees' Scholarship Fund to provide scholarships for students from northern New Mexico,
- \$58,000 to purchase 2,361 gifts kits for young people in need, senior citizens, and people facing homelessness, and
- \$24,000 to The Food Depot to fight food insecurity across the region.

Triad National Security, LLC, will match a portion of each employee's giving to charitable 501(c)(3) nonprofits based in the seven counties in which the majority of Laboratory employees reside (Los Alamos, Rio Arriba, Santa Fe, Taos, San Miguel, Mora, and Sandoval), as well as Eddy County, where the Laboratory also has a presence.

This year's match will be \$0.50 on the dollar, providing more support to the nonprofits in our region.

Many of the gift kits are being purchased from businesses in the region, also giving a boost to the local economy. For example, \$4,480 is going to the nonprofit play and discovery space Twirl in Taos to purchase kits for children.

Community Event Discusses Support for Regional Economy

On December 15, 2020, nearly 100 community leaders from northern New Mexico and beyond attended a Laboratory-organized Community Conversation on the state's economy. This event featured Laboratory Director Thom Mason and New Mexico Cabinet Secretary for Economic Development Alicia J. Keyes.

Mason highlighted the Laboratory's economic development initiatives, including the New Mexico Small Business Assistance Program, workforce pipeline partnerships with local colleges, and work designed to diversify Laboratory suppliers. This year, the Laboratory established contracts worth \$494 million with New Mexico businesses.

Mason also outlined funding from Laboratory operator Triad National Security, LLC, to the Regional Development Corporation for small business [micro-grants and no-interest loans](#).

Secretary Keyes and Deputy Secretary Jon Clark discussed the New Mexico's [programs to support businesses](#) (including the Job Training Incentive Program and LEDA), and highlighted the sectors in which the Economic Development Department is working to support growth, such as renewable energy, film, and television, and biosciences.

Employees Volunteered 3,018 Hours This Year for Regional Education and Nonprofits

This year, 321 Laboratory employees provided 3,018 service hours to educational and nonprofit organizations in northern New Mexico, benefiting an estimated 6,420 students, teachers and community members.

December 2020 kept teachers and volunteers busy. The month kicked off with Hour of Code, one-hour tutorials in computer coding for students K-12, which took place in New Mexico schools and around the world the week

of December, 7, 2020. Forty-five virtual volunteers from Los Alamos and Sandia national laboratories supported students in 80 classrooms across the state.

Next, the two New Mexico laboratories supplied volunteer judges (including 14 from the Laboratory) for the Towering Above Competition organized by New Mexico MESA. During this event, middle- and high-school students build towers using only engineering principles, in addition to paper, scissors, glue, and cellophane tape.

Laboratory engineers Melissa Espinosa and Benigno Sandoval represented the Laboratory at the second-annual New Mexico Governor's STEM Challenge, where STEM employers statewide supply two judges to evaluate student prototypes for cash rewards. The Laboratory award went to the team from Montel Del Sol Charter School in Santa Fe for their project "Garbage to Gas: Using Biodigesters to Create Energy." Each of the nine students on the team received a \$500 cash prize from the Laboratory.

Pueblo Alliance Awarded Master Task Ordering Agreement

The Laboratory's Acquisition Services Management Division has developed a Master Task Ordering Agreement (MTOA) with the Pueblo Alliance, LLC. The Building Maintenance and Operations MTOA provides the Laboratory with an acquisition vehicle that offers comprehensive coverage of services, including Operations and Maintenance, Facility Support Services, Logistics Services and Staff Augmentation.

A new [mentor-protégé program](#) agreement between the Laboratory and Pueblo Alliance, LLC, will groom and enable Pueblo businesses to land contracts with the Laboratory and DOE organizations. Mentorship areas include business planning, business development, marketing, proposal development and quality assurance. A DOE initiative, this program will be in effect for a minimum of two years with the option to extend it even longer.

RDC uses Triad Investment to Make Tribal Economic Diversity Fund Awards

Using an investment from Triad National Security, LLC, the Regional Development Corporation has made six Tribal Economic Diversity Fund awards to tribal businesses for critical technical services that lead to increased revenues and employment for the company.

The awards help provide services that enable the company to diversify revenue, leverage other investments, create new jobs, and have systems in place that lead to growth. Awardees include Itality Plant-Based Wellness (Jemez Pueblo), Yellowbird Consulting, LLC (San Ildefonso Pueblo), and Atcitty's on Taos Plaza (Taos Pueblo).

"RDC Director of Operations Carla Rachkowski and Program Manager Danny Maki have taken a lot of unusual steps to reach businesses eligible for these funds at this time when they cannot physically meet with tribal members, making the support given to the following businesses extra sweet this year," said RDC Executive Director Val Alonzo.

The [full list of recipients is available here](#).

SELECTED MEDIA COVERAGE

[For LANL, Preserving Our State is a Personal Mission](#)

Albuquerque Journal (11/29)

In the past 25 years, the lab has been very successful in environmental stewardship, despite public perception to the contrary. The truth is, Los Alamos National Laboratory is one of the most closely monitored places in New Mexico.

[Speeding Up the Development of New Materials](#)

Albuquerque Journal (11/29)

The Exascale Atomistic capability for Accuracy, Length, and Time project, or EXAALT – led by Los Alamos National Laboratory ... aims to develop a new generation of algorithms that would let researchers use very large computers in new and more flexible ways.

[Business People](#)

Santa Fe New Mexican—Teya Vitu (11/30)

Five Los Alamos National Laboratory scientists have been named fellows of the American Association for the Advancement of Science.

[Novel Chemical Process a First Step to Making Nuclear Fuel with Fire](#)

Laboratory Equipment (11/30)

Developing safe and sustainable fuels for nuclear energy is an integral part of Los Alamos National Laboratory's energy security mission. Uranium dioxide, a radioactive actinide oxide, is the most widely used nuclear fuel in today's nuclear power plants. A new "combustion synthesis" process recently established for lanthanide metals—non-radioactive and positioned one row

above actinides on the periodic table—could be a guide for the production of safe, sustainable nuclear fuels.

[Quantum Dot Paint Could Make Airframe Inspection Quick and Easy](#)

IEEE Spectrum—Rahul Rao (11/30)

Technicians of the future might be able to test airplane fuselages for airworthiness, check a bridge's structural integrity, or inspect an intricate 3D-printed part for defects with only a quick scan from a camera. Researchers at the Air Force Institute of Technology and Los Alamos National Laboratory are developing a paint containing quantum dots that could allow just that.

[Doc Brown Would Be Shocked by lightning 'Superbolts' Almost 100 Times More Powerful Than 1.21 Gigawatts](#)

Syfy Wire—Elizabeth Rayne (12/2)

"A myriad of lighting processes can produce a superbolt: intracloud pulses and cloud-to-ground strokes with a range of peak currents," said researcher Michael Peterson of Los Alamos National Laboratory, who led two studies recently published in the *Journal for Geophysical Research: Atmospheres*.

[Los Alamos National Lab Releases COVID-19 Post-Thanksgiving Forecast](#)

KRQE-TV—Gabrielle Burkhart (12/3)

The Los Alamos National Lab modeling team issued its December forecasting report, projecting daily number of cases to range between 1,768 and 3,899 in the next two weeks.

['Let's Talk Exascale': Storing and Managing Exa-class Data Volumes](#)

Inside HPC (12/4)

In this new edition of "Let's Talk Exascale" from the Department of Energy's Exascale Computing Project, the ECP's Scott Gibson talks with Jim Ahrens of Los Alamos National Laboratory about the project's data and visualization portfolio.

[Bioscience Division Teams Up with a New Mexico Small Business to Test Antibacterial Face Masks](#)

Los Alamos Reporter (12/6)

Around the country scientists and business leaders are thinking creatively about out-of-the-box ways to tackle the coronavirus, but closer to home a former Los Alamos National Laboratory chemist and a Bioscience Division staff member are applying known concepts to the simple face mask.

[COVID-19 Vaccine Provides Light at the End of the Tunnel](#)

Santa Fe Reporter—Julia Goldberg (12/8)

Los Alamos National Laboratory scientists who have played key roles in modeling the COVID-19 pandemic for New Mexico are now using mathematical models and computational simulations to evaluate scenarios for vaccine distribution.

[LANL: Breakthrough Material Makes Pathway to Hydrogen Use for Fuel Cells Under Hot and Dry Conditions](#)

LA Daily Post—Carol Clark (12/8)

A collaborative research team, including Los Alamos National Laboratory, University of Stuttgart (Germany), University of New Mexico, and Sandia National Laboratories, has developed a proton conductor for fuel cells based on polystyrene phosphonic acids that maintain high protonic conductivity up to 200°C without water.

[Los Alamos National Lab Chronicles its Multi-Faceted Computer Battle Against COVID-19](#)

HPC Wire—Staff Report (12/8)

As the pandemic nears the one-year mark, LANL has published a retrospective highlighting the wide variety of COVID-19 computing projects that the lab hosted over the last 11 months.

[New Calculation of the Hubble Constant](#)

SciTech Daily (12/19)

"We studied signals that came from various sources, for example recently observed mergers of neutron stars," said Ingo Tews, a theorist in Nuclear and Particle Physics, Astrophysics and Cosmology group at Los Alamos National Laboratory.

[Procurement at Los Alamos National Laboratory goes Digital](#)

Los Alamos Reporter (12/19)

Los Alamos National Laboratory is taking action to make it easier for New Mexico businesses to contract with it by upgrading to a new procurement software system.

[Distributing December's Most Anticipated New Release — The COVID-19 Vaccine](#)

Los Alamos Reporter (12/20)

At Los Alamos, scientists are using mathematical models and computational simulations enabled by LANL's supercomputing capabilities to understand how best to distribute the COVID-19 vaccine to minimize impacts on the healthcare system and the overall population.

New Calculation of the Hubble Constant

SciTech Daily (12/19)

"We studied signals that came from various sources, for example recently observed mergers of neutron stars," said Ingo Tews, a theorist in Nuclear and Particle Physics, Astrophysics and Cosmology group at Los Alamos National Laboratory.

LANL: Groundbreaking Software Helps Tame Blazes

Los Alamos Reporter (12/21)

Massive wildfires are scorching forests and brush country more frequently—an unintended consequence from decades of fire suppression and buildup of combustible fuels. Wildfire managers needed a tool to help cope with the risks of these high-intensity wildfires as well as proactively moderate fire behavior. Los Alamos National Laboratory researchers and their collaborators invented QUIC-Fire to meet that need.

New Radionuclide Enables PET Imaging of Targeted Alpha Cancer Therapies

Healthcare Business News (12/21)

"This advancement offers new possibilities for medical staff and drug developers to better characterize new actinium and thorium therapeutics," said Stosh Koziomor, lead Los Alamos National Laboratory researcher on the joint project.

Coronavirus Pandemic News

CNN "New Day"—Alisyn Camerota and John Berman (12/22)

Dozens of countries have already banned or restricted travel from the UK at this point because of this new variant of coronavirus spreading there. Joining us now, David Montefiore, researcher at Duke University, and also a member of the warp speed laboratory. Also, Bette Korber, a computational biologist at Los Alamos National Lab in New Mexico, and also an expert in HIV evolution, and now turning her attention to the coronavirus fight.